

Questions from Homework?

$$9f) \quad (x, y) \rightarrow \left(\frac{x}{\frac{10}{7}} + 12, -y + 6 \right)$$
$$(x, y) \rightarrow \left(\frac{7x}{10} + 12, -y + 6 \right)$$

$$(0, 0) \rightarrow (12, 6)$$
$$(1, 1) \rightarrow \left(12\frac{7}{10}, 5 \right)$$
$$(-1, -1) \rightarrow \left(11\frac{3}{10}, 7 \right)$$

Lesson 3.06 - Factoring Polynomials Day 1



Learning Goals:

- I can determine a factor of a polynomial.
- I can factor polynomials.
- I can state the Factor Theorem and the Remainder Theorem and apply it

$$\begin{array}{r} 16x^2 + 16x + 3 \\ x-1 \overline{) 16x^3 + 0x^2 - 13x - 3} \\ \underline{16x^3 - 16x^2} \\ 16x^2 - 13x \\ \underline{16x^2 - 16x} \\ 3x - 3 \\ \underline{3x - 3} \\ 0 \end{array}$$

Consider the polynomial $f(x) = x^3 + 2x^2 - 5x - 6$

Evaluate:

$$\begin{aligned} \text{a) } f(-2) &= (-2)^3 + 2(-2)^2 - 5(-2) - 6 \\ &= -8 + 2(4) + 10 - 6 \\ &= -8 + 8 + 10 - 6 \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{b) } f(1) &= 1 + 2 - 5 - 6 \\ &= -8 \end{aligned}$$

Divide by:

a) $x+2$

$$\begin{array}{r} x^2 \quad -5 \quad \textcircled{Q} \\ x+2 \overline{) x^3 + 2x^2 - 5x - 6} \\ \underline{-x^3 + 2x^2} \\ 0 - 5x - 6 \\ \underline{- - 5x - 10} \\ 4 \quad \textcircled{R} \end{array}$$

$$\begin{array}{r} x-1=0 \\ x=1 \\ \text{b) } x+1 \\ \overline{) \begin{array}{cccc} 1 & 2 & -5 & -6 \\ & 1 & 3 & -2 \\ \hline 1 & 3 & -2 & \boxed{-8} \end{array}} \\ \textcircled{Q} \quad x^2 + 3x - 2 \end{array}$$

What do you notice?!

Remainder Theorem: The remainder of a polynomial $p(x)$ when divided by $x - a$ is equal to $p(a)$

Consider the same polynomial $f(x) = x^3 + 2x^2 - 5x - 6$

Evaluate:

$$\begin{aligned} f(2) &= (2)^3 + 2(2)^2 - 5(2) - 6 \\ &= 8 + 8 - 10 - 6 \\ &= 0 \end{aligned}$$

Divide by:

$x-2$

$$\begin{array}{r} 2 \overline{) \begin{array}{cccc} 1 & 2 & -5 & -6 \\ & 2 & 8 & 6 \\ \hline & & 3 & 0 \end{array}} \end{array}$$

Factor Theorem: A polynomial $p(x)$ has a factor of $x - a$ if and only if $p(a) = 0$

Factor this polynomial completely, if it is factorable: $f(x) = x^3 - 6x^2 - x + 30$

Possible:
 $\pm 1, \pm 5, \pm 6, \pm 2, \pm 15, \pm 10, \pm 3, \pm 30$

$$\begin{aligned} f(-2) &= (-2)^3 - 6(-2)^2 - (-2) + 30 \\ &= -8 - 24 + 2 + 30 \\ &= 0 \end{aligned}$$

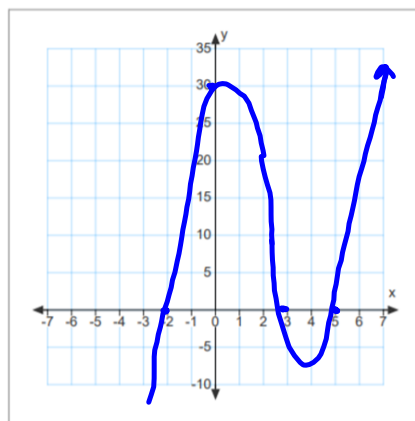
$\therefore f(-2) = 0$, $x+2$ is a factor!

$$\begin{array}{r|rrrr} -2 & 1 & -6 & -1 & 30 \\ & & -2 & 16 & -30 \\ \hline & 1 & -8 & 15 & 0 \end{array}$$

$$\begin{aligned} \therefore (x+2)(x^2 - 8x + 15) \\ = (x+2)(x-5)(x-3) \end{aligned}$$

y-int, $x=0$

$$\begin{aligned} f(0) &= (2)(-5)(-3) \\ &= 30 \end{aligned}$$



Homework:

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